Response to letter to the editor

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To the editor:

We thank the readers for their attention to and valuable comments on our recent publication [1]. Indeed, definite conclusions should be delayed until further prospective studies address their concerns. However, we would be honored if our findings provoke interest in further research.

Blood samples were collected through a single venipuncture instead of sampling from the jugular bulb to minimize patient risks. As the internal jugular vein drains blood from the skull and superficial parts of the face [2], our method may be associated with extracerebral contamination. Nevertheless, we consider that our method can better reflect ipsilateral cerebral oxygenation than indicators of global oxygenation, such as mixed venous oxygen saturation.

The effects of excluding 40 patients on the study results cannot be determined; however, they were not significantly different from those included in the study in terms of patient characteristics (Supplementary Table 1). Although the sample size was smaller than expected, our initial hypothesis could be demonstrated because the degree of underestimating the cerebral oxygenation using the near-infrared spectroscopy in patients undergoing hemodialysis (HD) was larger than expected.

To respond to their concern on residual confounding, we conducted an additional multivariable analysis adjusting for age, mean arterial pressure, and hemoglobin level and found that HD was independently associated with difference between regional cerebral oxygen saturation and jugular venous oxygen saturation (Supplementary Table 2).

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Conflict of interest

No conflict of interest to declare.

References

1. Matsukawa S, Kai S, Mizota T. Near-infrared spectroscopy underestimates cerebral oxygenation in hemodialysis patients. *J Anesth.* 2019;33:478-81.

2. Watkinson JC, Gleeson M. Neck. In: Standring S, editor. Gray's anatomy: The anatomical basis of clinical practice. 41 ed. New York: Elsevier; 2016. p. 442–74.

Supplementary materials

Supplement to: Matsukawa S, Kai S, Mizota T. Response to letter to the editor. J Anesth.

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Supplementary Table 1. Characteristics of patients excluded from and included in the study. Analysis was performed using the dataset from a previous study (Matsukawa S., et al. J Anesth. 2019;33:478–81).

	Excluded patients (n = 40)	Included patients (n = 113)	*P*-value
Age (years)	67 (49–74)	69 (62–77)	0.083
Female gender	11 (27.5%)	37 (32.7%)	0.539
Weight (kg)	63.0 (54.0–69.9)	62.5 (53.2–71.3)	0.826
Height (m)	1.66 (1.57–1.71)	1.62 (1.56–1.68)	0.216
HD	3 (7.5%)	7 (6.2%)	0.774

HD, hemodialysis

Supplementary Table 2. Multivariable linear regression analysis evaluating the association of HD status with the difference between rSO_2 and $SjvO_2$ independent of age, mean arterial pressure, and hemoglobin concentration. Analysis was performed using the dataset from a previous study (Matsukawa S., et al. J Anesth. 2019;33:478–81).

Variables	Regression coefficient	95% confidence interval	*P*-value
HD	−16.0	−23.1 to −8.8	<0.001
Age (per 10 years)	−0.66	−1.96 to 0.65	0.319
Mean arterial pressure (per 10 mmHg)	−0.24	−1.43 to 0.96	0.697
Hemoglobin concentration (per 1 g/dL)	0.97	0.04 to 1.89	0.041

HD, hemodialysis; rSO_2, regional cerebral oxygen saturation; $SjvO_2$, jugular venous saturation